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ARM Facilities Newsletter

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Icy Cirrus Clouds to Be Studied This Spring

Mid-latitude cirrus clouds, which are composed solely of ice crystals, will be the focus of an intensive operational period (IOP) in April and May 2004 at the ARM Climate Research Facility (ACRF) SGP site. Researchers will be probing the clouds with aircraft-based instruments to gather detailed information about the clouds' physical characteristics.

To make measurements in cirrus clouds, which generally form in the atmosphere at and above 20,000 feet (almost 4 miles), researchers will use the National Aeronautics and Space Agency (NASA) WB-57, a high-altitude research aircraft. The WB-57 can fly at altitudes above 60,000 feet for distances up to 2,500 miles, and it can carry instrument payloads as heavy as 6,000 pounds. While two crew members guide the WB-57 on predetermined flight paths selected by research scientists, the instruments gather data continuously from areas of interest.



Figure 1. The NASA WB-57 high-altitude research aircraft. (NASA photo)

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The NASA WB-57 will fly over the SGP site on April 14–May 15, 2004. Dr. Gerald Mace from the University of Utah's Department of Meteorology will head the project. Eight scheduled flights during the IOP will provide approximately 50 hours of flight time for data collection. Instruments aboard the WB-57 will measure such things as cirrus cloud particle size distribution, ice crystal particle habit, ice mass concentration, water vapor values, and aerosol coefficients. The data collected in the clouds will be integrated with the vast array of data collected on the ground by the SGP site's suite of instruments to improve understanding of cirrus clouds and their processes. The ultimate goal is improving computer climate models so that they can predict climate change more accurately.

Maintaining the ACRF SGP Site Instruments

Throughout the SGP site (55,000 square miles), 31 instrument facilities house nearly 200 instruments and more than 800 individual sensors. The instruments operate continuously to provide uninterrupted streams of data to the research community. To achieve these results, ACRF adheres to a strictly controlled instrument maintenance program.

The SGP site employs highly trained field technicians who are experts in servicing and maintaining the field instruments for all ACRF sites. Most of the instruments are unique and were custom-built for their purpose. To achieve the best data stream possible, instrument mentors and vendors train the technicians in operation and maintenance and also provide troubleshooting support.

ARM Facility Gets New Name

The ARM Climate Research Facility (ACRF) SGP site was formerly known as the Cloud and Radiation Testbed (CART). The new name reflects the research site's new status as a U.S. Department of Energy national user facility for climate change research.

ACRF requires routine preventive maintenance for each of the 31 instrument facilities at the SGP site. Included are the central facility, 23 extended facilities, 4 boundary facilities, and 3 intermediate facilities. Though all of the instruments receive preventive maintenance at least every two weeks, most of the instruments at the central facility are serviced daily during the five-day work week.

The SGP site is divided into quadrants that delineate service areas. Field maintenance teams are assigned to routes for the extended facilities (Figure 2) and for the boundary and intermediate facilities (Figure 3). Two weeks are needed to service all 23 extended facilities. At the start of the first week, two field maintenance teams set out from the central facility. One team services the extended facilities in the northeast quadrant, while the second team services the extended facilities in the northwest quadrant. During the second week, the teams service the extended facilities in the southeast and southwest quadrants.

Field technicians travel with a complete supply of test equipment and spare parts. When they arrive at an extended facility site, for example, the technicians contact the site data system computer operator at

the central facility, so that remote, automated data collection processes can be shut off during maintenance. This procedure assures that no incorrect data are collected and archived. The technicians proceed with the preventive maintenance checks on the instruments

everything is in proper order. Once the maintenance checks have been completed, remote data collection is reestablished, and the team moves on to the next site on its route. The same procedure is carried out for the boundary and intermediate facilities.



Figure 2. Extended Facility service routes (NE, NW, SE, SW) for the ACRF SGP site.

and the communications equipment at the site. All procedures are documented on the technician's laptop computer for later inclusion in the database. The technician also performs scheduled repairs to instruments and records on-site observations of vegetation types and heights. The team inspects and documents the condition of the grounds and the safety equipment to ensure that

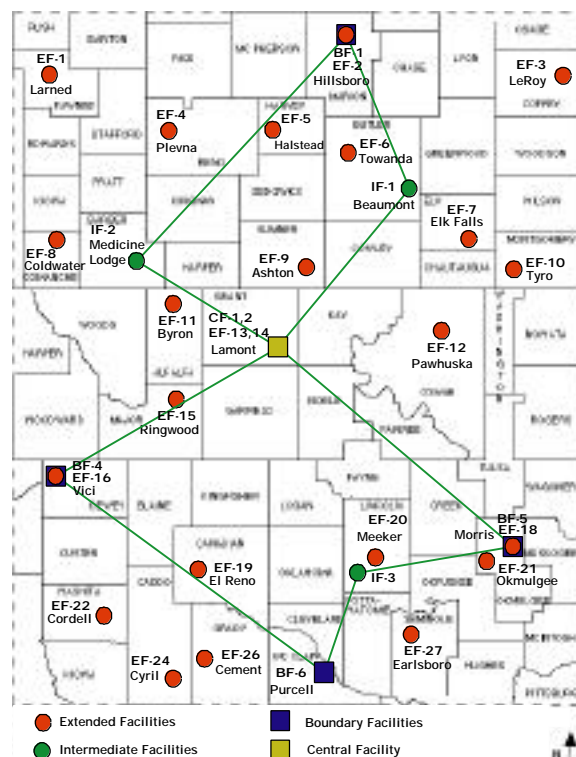


Figure 3. Boundary and Intermediate Facility service routes (N, S) for the ACRF SGP site.

In addition to the regularly scheduled preventive maintenance visits, the field technicians are on call and can be dispatched to make emergency repairs on essential instruments. This is most important during IOPs, when continuous data collection is most crucial. Much time and effort are expended to keep the SGP site's large outdoor laboratory functional.